

An aerial photograph of a large reservoir and a dam. The reservoir is a light blue color, surrounded by green trees and grass. A dam structure is visible in the middle ground, with a road or path leading to it. The sky is clear and blue. Overlaid on the image is the text 'CWMS' in large, red, stylized letters with a black outline.

# CWMS

Corps Water Management System

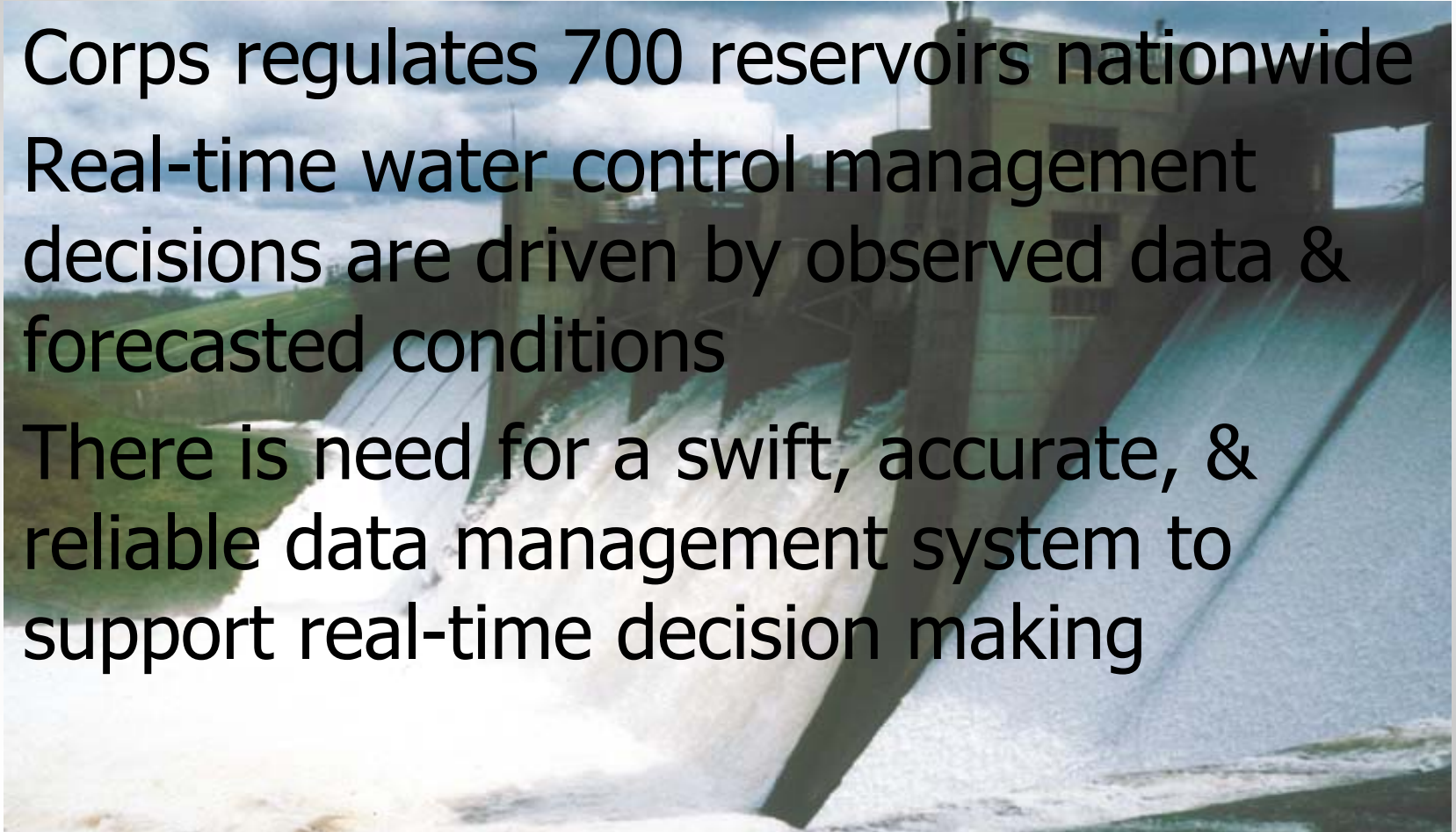
U.S. Army Corps of Engineers



# Perspective

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- Corps regulates 700 reservoirs nationwide
- Real-time water control management decisions are driven by observed data & forecasted conditions
- There is need for a swift, accurate, & reliable data management system to support real-time decision making





# Moving to CWMS Vocabulary, etc.

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- DSS -> Data Storage System
  - Developed in late '70s by Corps' Hydrologic Engineering Center (HEC)
  - Time series and paired data and text only
  - Provided a common database format (proprietary) to feed models
  - Suite of data management tools developed
  - Deployed worldwide
- CWMS -> Corps Water Management System
- CROHMS -> Columbia River Operational Hydromet Management System
  - Developed by NWD in 60s
  - Initially proprietary format until migrated to DSS format in 1991



# **BREAKING NEWS!!**

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**CROHMS AIN'T GOIN' NOWHERE**

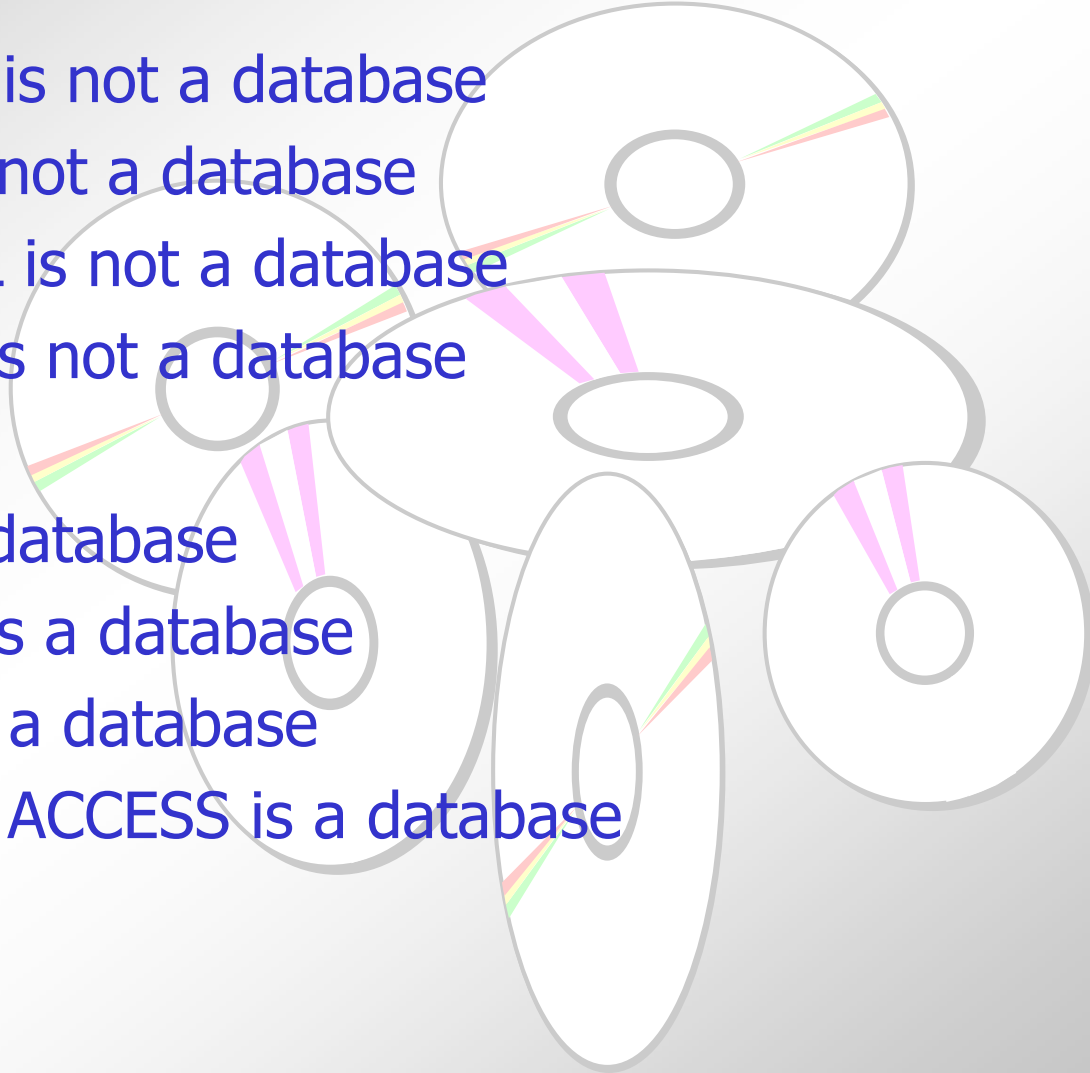




# ISN'Ts and ISs

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- CROHMS is not a database
- CWMS is not a database
- SEDQUAL is not a database
- STORET is not a database
- DSS is a database
- ORACLE is a database
- MySQL is a database
- Microsoft ACCESS is a database

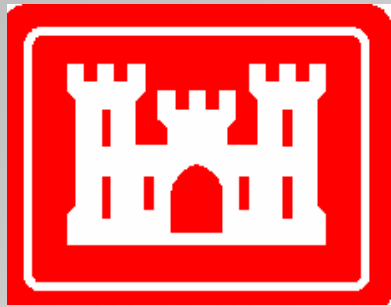




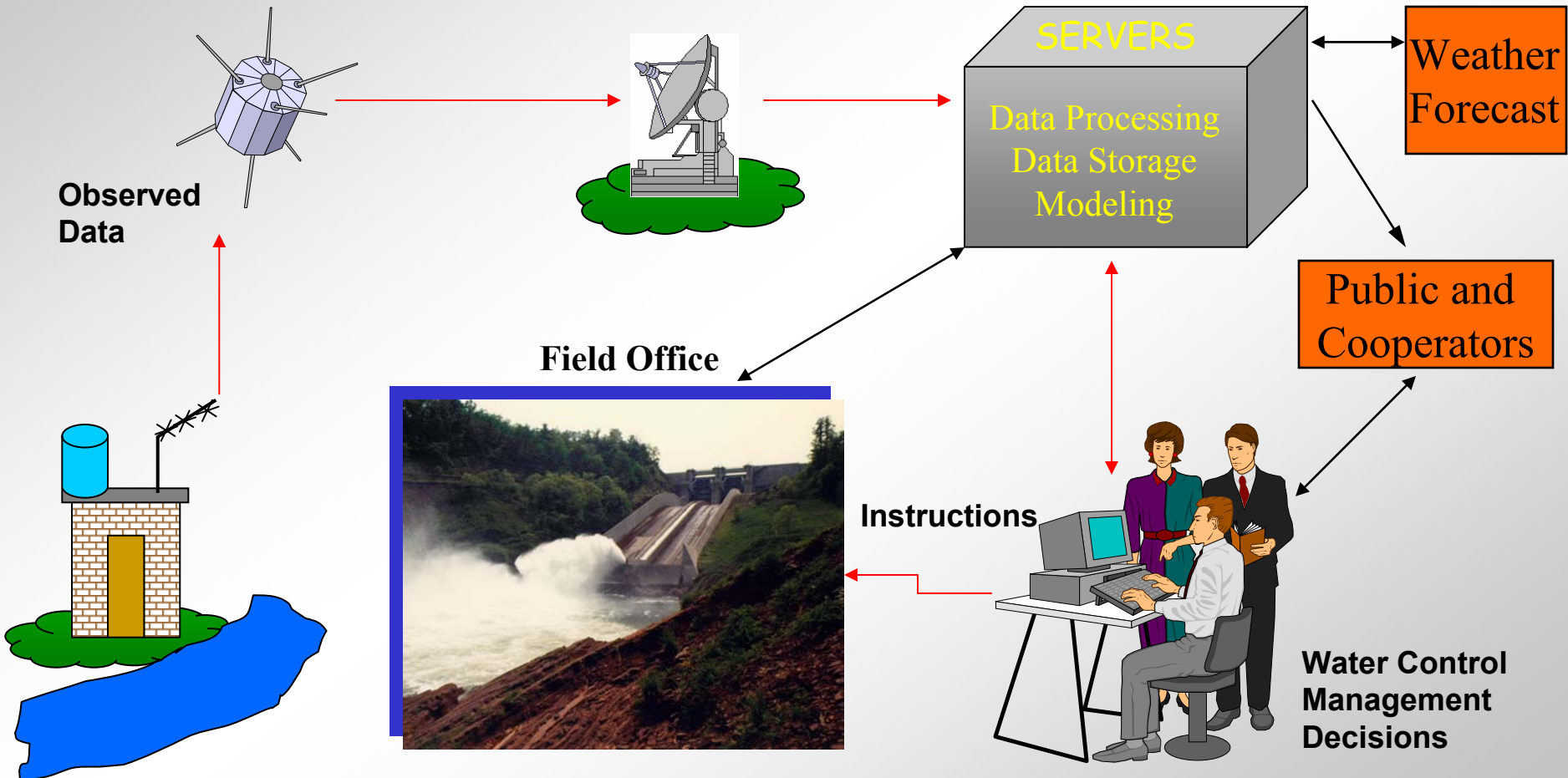
# CWMS Overview

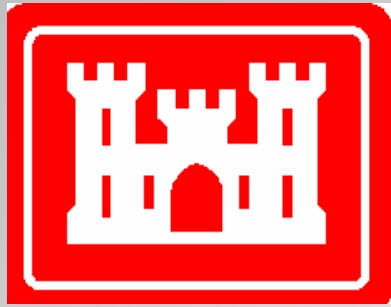
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An integrated system of  
hardware, software, and communication  
resources supporting the  
Corps' real-time water control  
management mission



# From Data to Water Control Management Decisions





# **Integration of GIS (Geographic Info Systems)**

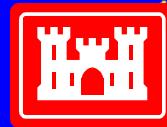
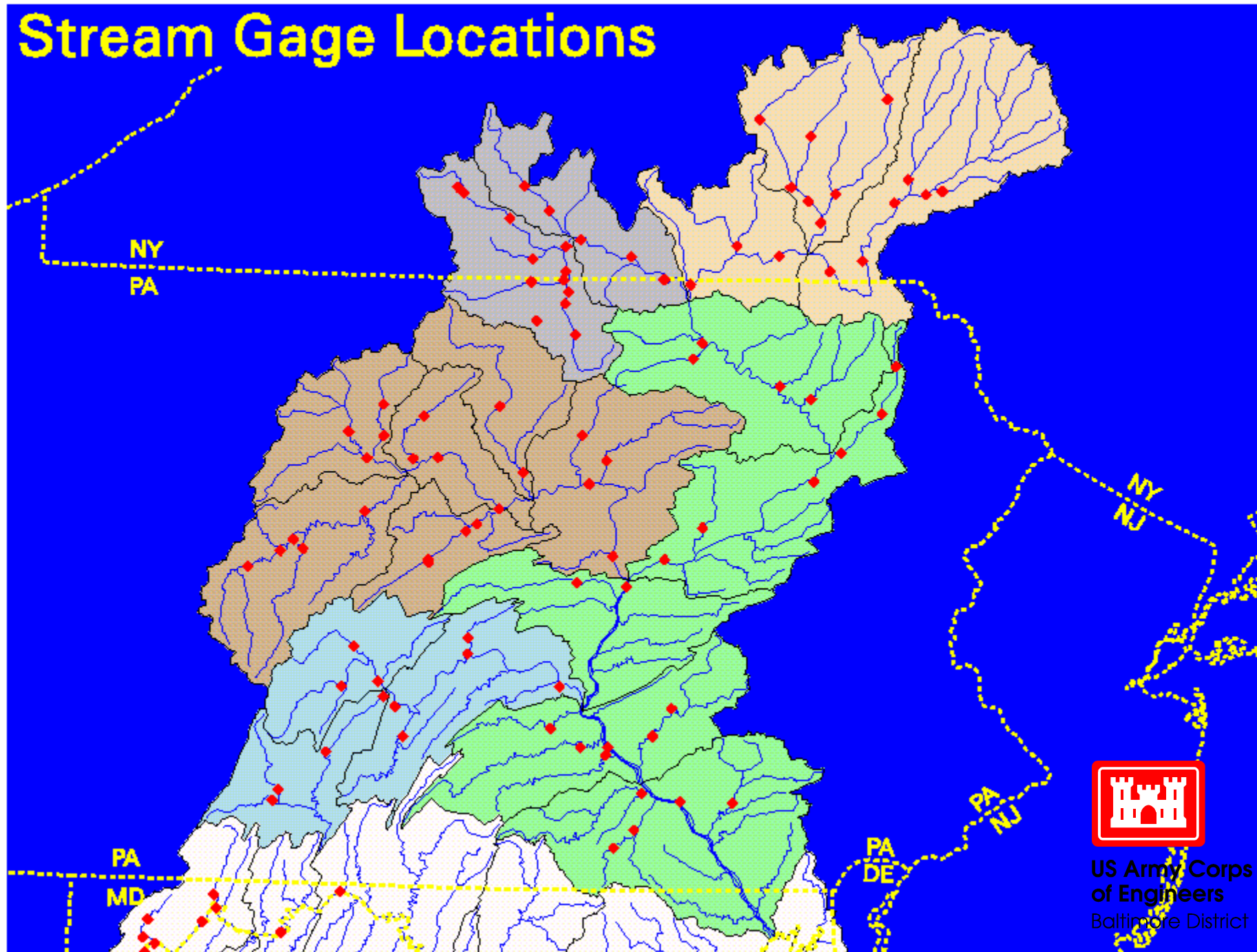
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- GIS used throughout modeling process:

- 👉 Watershed delineation
- 👉 Calculation of physical characteristics used to estimate hydrologic parameters
- 👉 Development of gridded data
- 👉 Extraction of cross-sections for use in RAS
- 👉 Delineation of inundated areas
- 👉 Detailed analysis of data for Emergency Response purposes

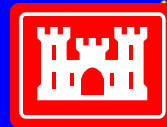
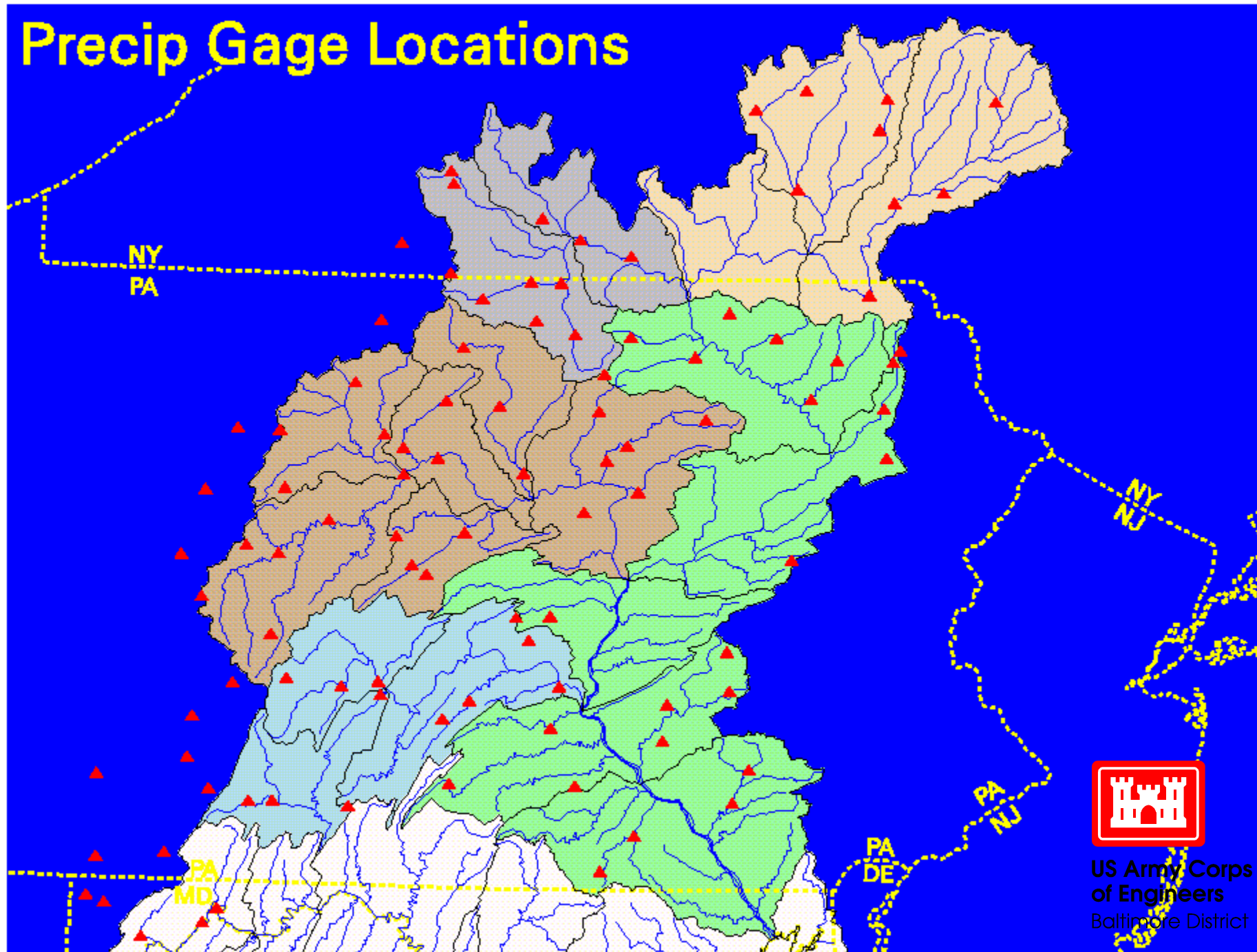


# Stream Gage Locations

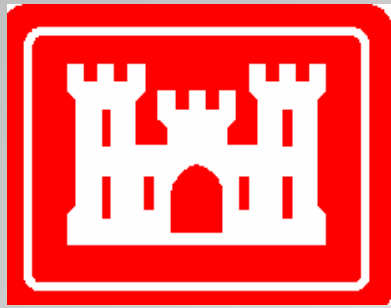


US Army Corps  
of Engineers  
Baltimore District

# Precip Gage Locations

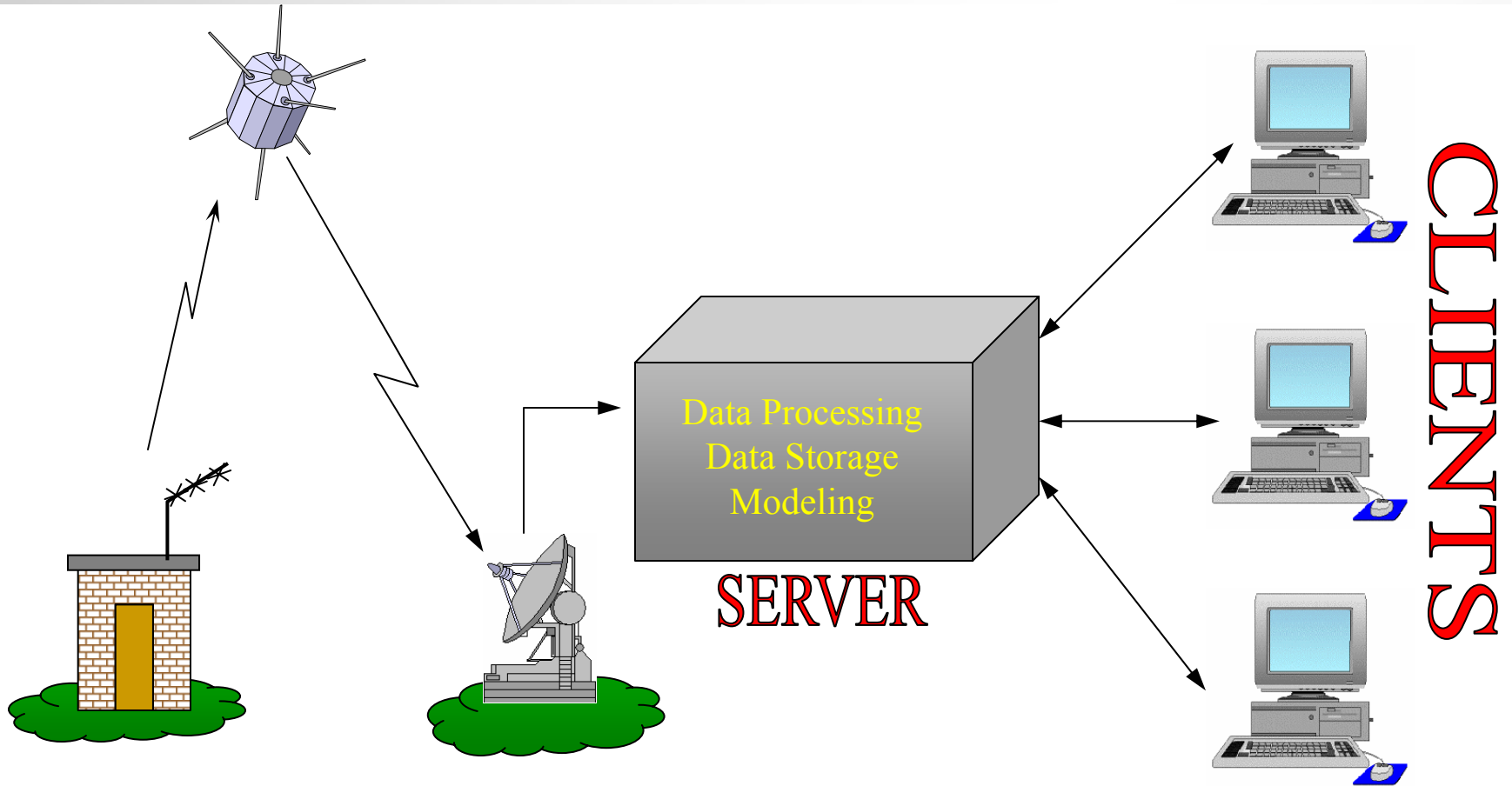


US Army Corps  
of Engineers  
Baltimore District



# Hardware & Software Setup

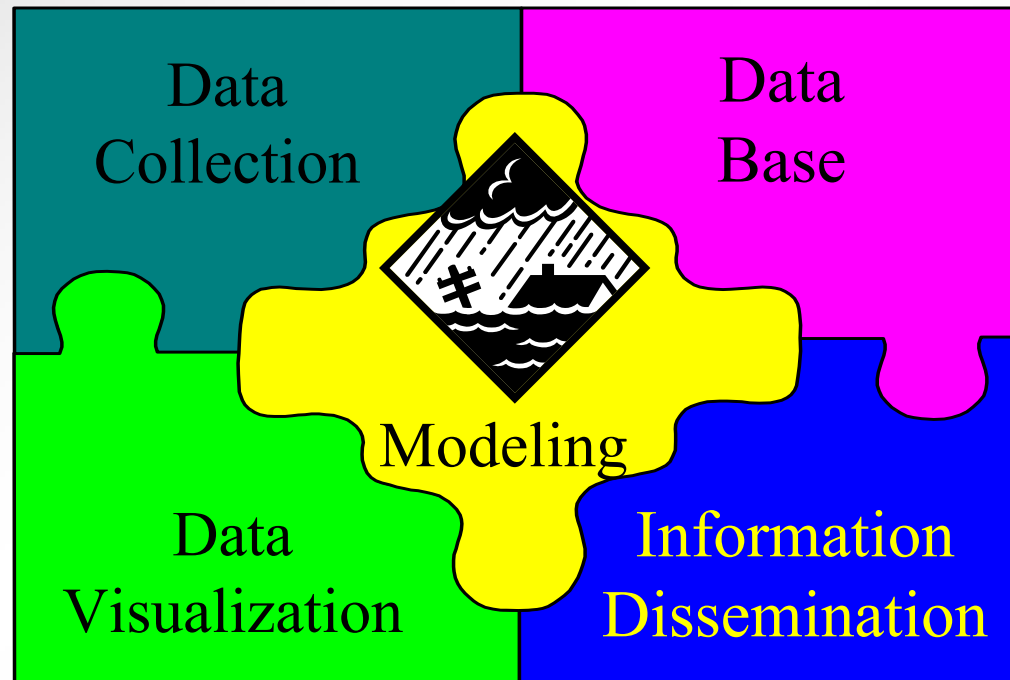
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# CWMS Components

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# Data Acquisition

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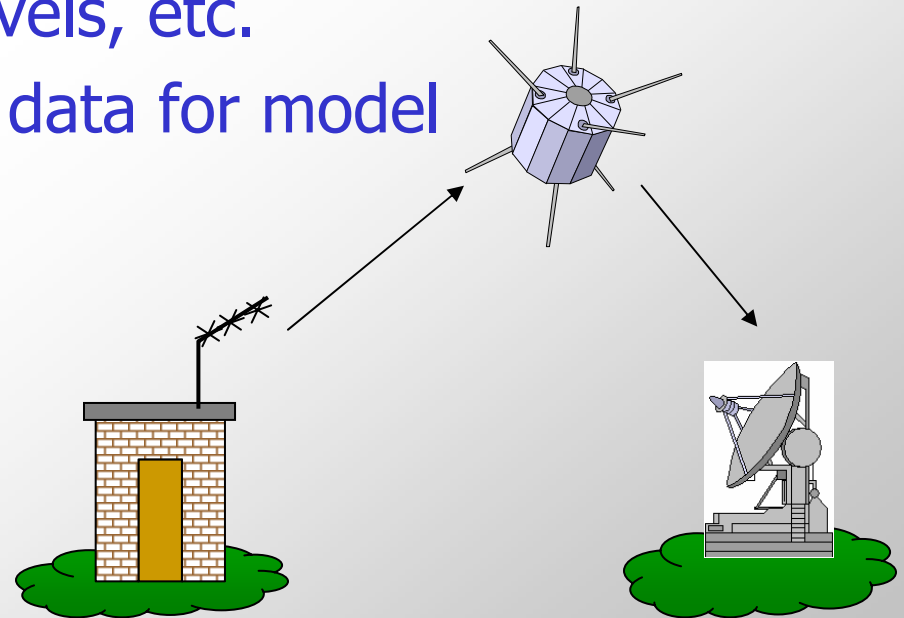
- Collect:

- ✎ Real-time data: observed stream flow, precipitation, temperature, water quality, gate settings, reservoir levels, etc.
- ✎ Static data: physical data for model development

- Decode

- Validate

- Transform

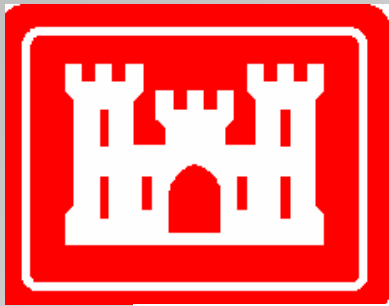




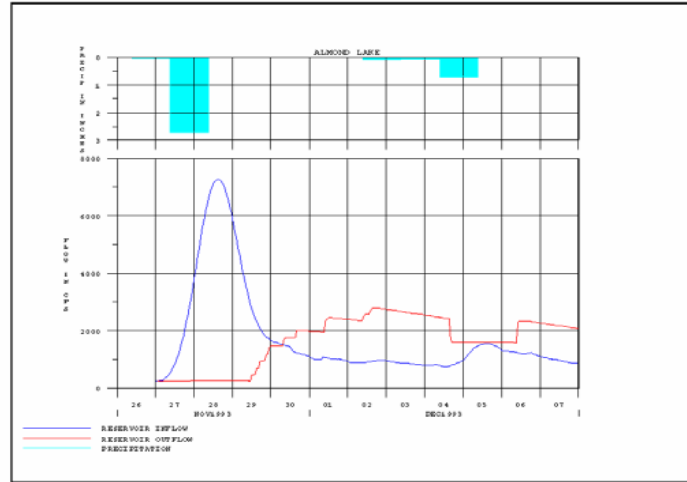
# Data Base

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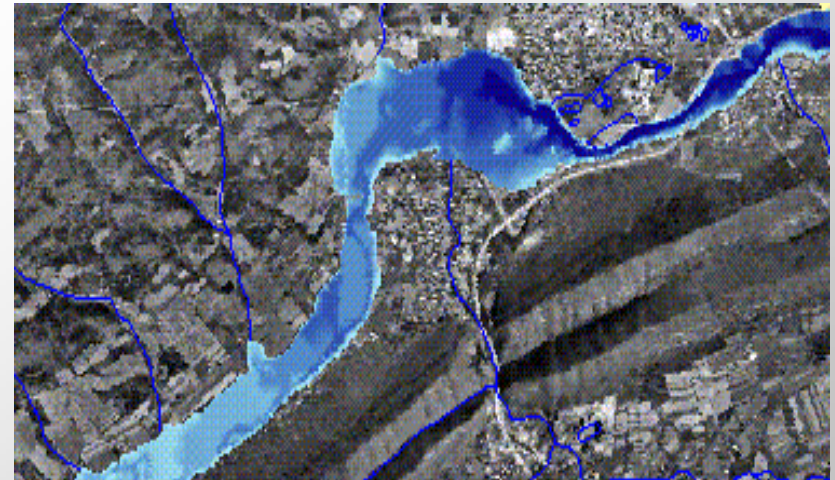
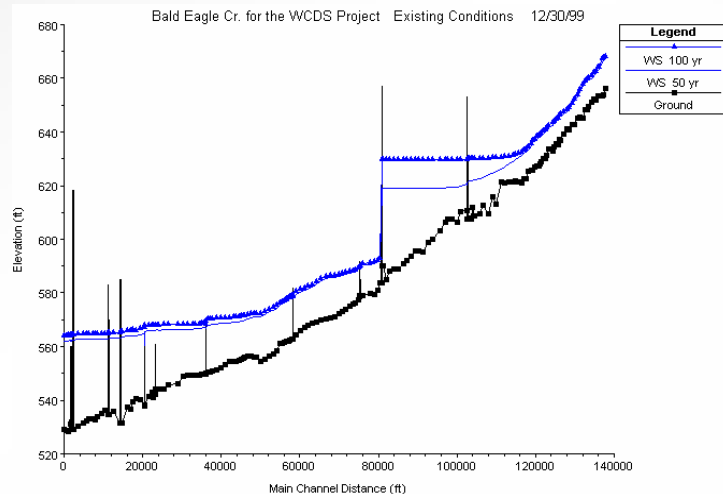
- ORACLE is CWMS record database
- Interfaces with other databases
- Accessible by multiple users
- Modeling
- GIS database

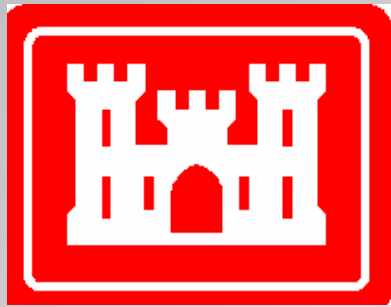


# Data Visualization



| Impact Action Report |       |                                   |                                    |               |               |
|----------------------|-------|-----------------------------------|------------------------------------|---------------|---------------|
| Impact Area          | Stage | Impact                            | Action                             | Time          | Time          |
| Cottage Area         | 556.0 | Flood Warning Stage               | Initiate Reconnaissance and...     | 5BGEN.frun    | 8BGEN.frun    |
|                      | 558.0 | Flood Stage                       | Full Alert, Warn of Potential E... | 12Nov99 03:00 | 12Nov99 03:00 |
|                      | 560.0 | Damage to Infrastructure, La...   | Close Life Lines, Roads/ Loc...    | 12Nov99 04:00 | 12Nov99 04:00 |
|                      | 561.0 | Egress Begins to be a Probl...    | Evacuate Residences, Perfor...     | 12Nov99 05:00 | 12Nov99 05:00 |
|                      | 567.0 | All Cottage Area Buildings Fl...  | Continue Surveillance              | 12Nov99 05:00 | 12Nov99 05:00 |
| Lock Haven           | 535.2 | Zero stage reading                | None                               | 09Nov99 24:00 | 09Nov99 24:00 |
|                      | 540.1 | Flap gates of interior drains ... | Check drains to ensure oper...     | 11Nov99 22:00 | 11Nov99 23:00 |
|                      | 543.2 | Elevation of Grant Street Dam     | None                               | 11Nov99 23:00 | 11Nov99 24:00 |
|                      | 545.0 | Handrails at Summer Beach         | Remove handrails & close G...      | 11Nov99 24:00 | 12Nov99 01:00 |
|                      | 549.0 | Grant Street Dam platform el...   | None                               | 12Nov99 01:00 | 12Nov99 02:00 |
|                      | 553.0 | Flood Warning Stage               | Begin levee patrol                 | 12Nov99 02:00 | 12Nov99 02:00 |
|                      | 556.2 | Flood Stage                       | River overtops bank                | 12Nov99 03:00 | 12Nov99 03:00 |
|                      | 556.3 | Bath house floor elevation        | Close bath house                   | 12Nov99 03:00 | 12Nov99 03:00 |
|                      | 557.2 |                                   | Prepare to close Closure Str...    | 12Nov99 03:00 | 12Nov99 03:00 |
|                      | 559.1 |                                   | Close Closure Structure No. 3      | 12Nov99 04:00 | 12Nov99 03:00 |
|                      | 559.2 |                                   | Prepare to close Closure Str...    | 12Nov99 04:00 | 12Nov99 03:00 |
|                      | 561.0 |                                   | Close Closure Structure No. 2      | 12Nov99 05:00 | 12Nov99 04:00 |
|                      | 564.0 |                                   | Prepare to close Closure Str...    | 12Nov99 07:00 | 12Nov99 05:00 |
|                      | 565.0 | Base elevation of Closure Str...  | None                               | 12Nov99 09:00 | 12Nov99 06:00 |
|                      | 566.0 |                                   | Close Closure Structures No...     |               | 12Nov99 07:00 |
|                      | 567.0 | Evacuation Alert Stage            | Prepare for Lock Haven evac...     |               | 12Nov99 07:00 |
|                      | 572.0 | Danger Stage                      | Evacuation of Lock Haven           |               | 12Nov99 13:00 |





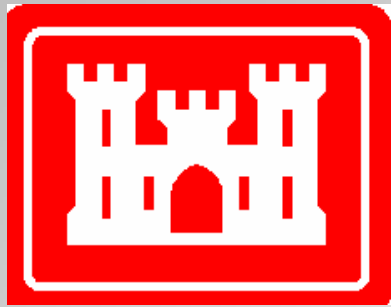
# Information Dissemination

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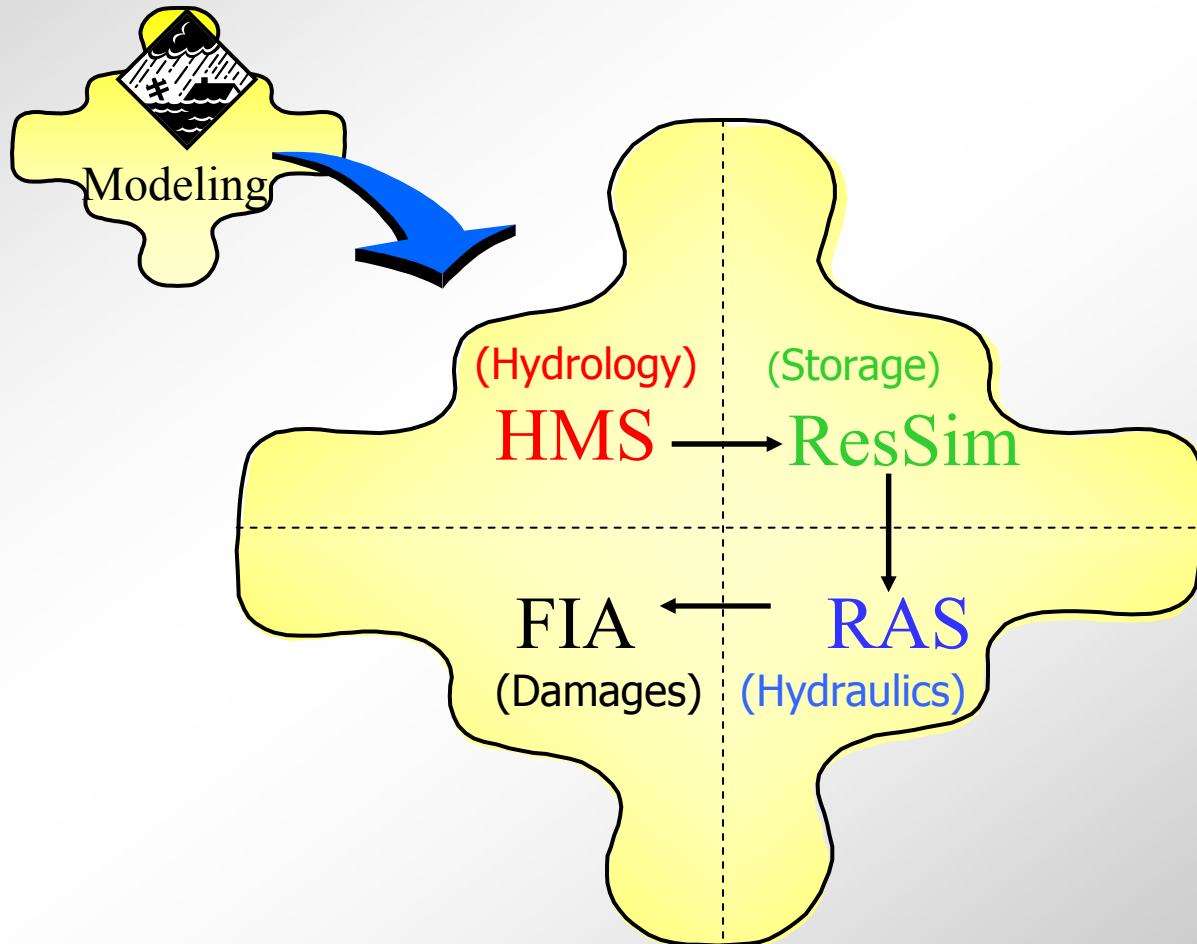
- Common information source
- Data & information placed on WEB-based platform
  - Available to Corps users & outside interests
  - Real-time availability

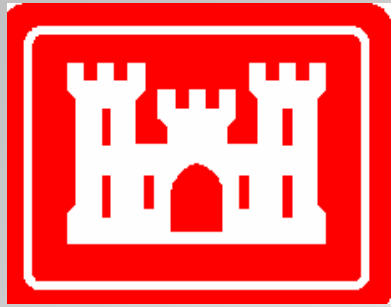






# Watershed Modeling

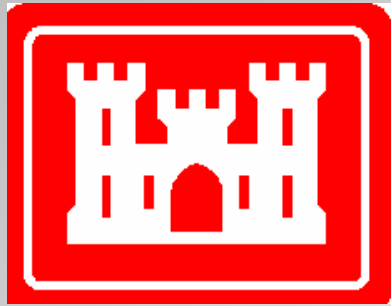




# **CWMS Products for Water Control Management**

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- Automated data acquisition
- Standard Corps database
- Seamless integrated models
- Timely simulations
- Inundation mapping
- Real-time water control decision support



# CWMS

## Requirements

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- Wide gage network for real-time data collection
- Extensive hydrologic, hydraulic, boundary, & damage information
- Modeling expertise
- Detailed mapping
- Fast & reliable client/server system
- Time and money for development



# Applications

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- CWMS provides real-time water control management decision support
- Emergency planning and response
- Project planning (new projects, alternative projects, modified regulation)
- Post-event analyses (benefits)
- Flood plain studies



# Database Query

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- Complete period-of-record database online
- <http://www.nwd-wc.usace.army.mil/cgi-bin/dataquery.pl>
- CWMSQuery available in a couple of months
- Need support?
  - Email: [cenwd.cwms.help@usace.army.mil](mailto:cenwd.cwms.help@usace.army.mil)



CWNMS

Corps Water Management System